

REMARKS

Claims 1-29 are pending in this application.

Claim Rejections

Rejection Under 35 U.S.C. § 102

- A. Response to Rejection of claims 1-29 under 35 U.S.C. §102(a, b or e) as being anticipated by Miyakawa et al. or Skilbeck or Krupinski et al. or Beuermann et al. or the '862 Document.

In response to the rejection of claims 1-29 under 35 U.S.C. §102(a, b, or e) as being anticipated by U.S. Patent No. 5,237,048 of Miyakawa et al. ("Miyakawa"), or U.S. Patent No. 5,380,822 of Skilbeck ("Skilbeck") or U.S. Patent No. 5,691,445 of Krupinski et al. ("Krupinski") or European Patent Application EP 1201682 of Beuermann et al. ("Beuermann") or GB 894,862 ("862 Document"), Applicants submit that the cited references do not disclose all the elements of the claims.

For a reference to anticipate an invention, all of the elements of that invention must be present in the reference. The test for anticipation under section 102 is whether each and every element as set forth in the claims is found, either expressly or inherently, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must also be arranged as required by the claim. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

A first embodiment of the current subject matter relates to a method for continuously removing unreacted butene-1 and optionally other volatile components from a polymeric solution produced by liquid phase (co)polymerization of butene-1, the method comprising the steps of:

- a) subjecting the polymeric solution to heating and mixing conditions such that a mixture is formed consisting essentially of: (1) a polybutene melt containing entrapped butene-1 and (2) supercritical gaseous butene-1; and
- b) subjecting the mixture of step a) to a sequence of devolatilization steps operating at decreasing pressures and at temperatures comprised between 170 and 220°C.

A second embodiment of the current subject matter relates to a method for continuously

removing unreacted monomer and optionally other volatile components from a polymeric solution produced by a liquid-phase (co)polymerization of butene-1, the method comprising the steps of:

- a₁) subjecting the polymeric solution to heating and mixing conditions so as to cause part of the butene-1 to separate from the solution, thereby forming a product of step a₁;
- a₂) subjecting the product of step a₁) to a further heating such that a two-phase mixture is formed consisting essentially of: (1) a polybutene melt containing entrapped butene-1 and (2) supercritical gaseous butene-1; and
- b) subjecting the two-phase mixture of step a₂ to a sequence of devolatilization steps operating at decreasing pressures and at temperatures comprised between 170 and 220°C.

A third embodiment of the current subject matter relates to a process for obtaining butene-1 (co)polymers comprising the following steps:

- a) (co)polymerizing butene-1 in liquid phase in the presence of a catalyst system based on a transition metal compound to obtain a solution of polybutene-1 in butene-1;
- b) removing an amount of unreacted butene-1, optionally together with other volatile components, from said solution by
 - (I) subjecting the solution to heating and mixing conditions such that a mixture is formed consisting essentially of: (1) a polybutene melt containing entrapped butene-1 and (2) a supercritical gaseous butene-1;
 - (II) subjecting the mixture of step (I) to a sequence of devolatilization steps operating at decreasing pressures and at temperatures comprised between 170 and 220°C .

Miyakawa does not disclose a polymeric solution produced by the liquid phase (co)polymerization of butene-1. In fact, the reference does not disclose butene-1 or poly-1-butene at all. Moreover, Miyakawa certainly does not disclose the levels of butene-1 or poly-1-butene-1 recited in the dependent claims, as in, for example, claims 3, 11, 13, 14, 17, 19, 22, 23, 26 and 28. Finally, the method described in Miyakawa for purifying a polymer is totally different from the claimed method, since it is based on the use of an extractant, (CO₂), in a liquid or

supercritical state, which is contacted with the molten polymer to remove volatile materials contained in the polymer (col. 3, lines 11-54). Therefore, the reference does not disclose all the elements of the present claims.

Skilbeck does not disclose a polymeric solution produced by the liquid-phase (co)polymerization of butene-1. The polymers disclosed in Skilbeck are polymers of vinyl aromatic monomers or blends thereof and polyphenylene oxide (col. 1, lines 10-14). In fact, butene-1 or poly-1-butene are not mentioned at all. Moreover, Skilbeck certainly does not disclose the levels of butene-1 or poly-1-butene recited in the dependent claims, as in, for example, claims 3, 11, 13, 14, 17, 19, 22, 23, 26 and 28. Finally, Skilbeck's separation method is significantly different than the method described in the current claims in that it is based on injecting into the polymer or polymer blend a suitable amount of water at temperatures from 200 to 270°C, and pressures from 500 to 1500 psi (col. 2, lines 57-61). Therefore, the reference does not disclose all the elements of the present claims.

Krupinski relates to the devolatilization of molten polymers of vinyl aromatic monomers or blends thereof and polyphenylene oxide (col. 1, lines 5-10; col. 5, lines 3-15). A polymeric solution based on poly-1-butene or butene-1 monomers is not mentioned at all. Moreover, Krupinski certainly does not disclose the levels of butene-1 or poly-1-butene recited in the dependent claims, as in, for example, claims 3, 11, 13, 14, 17, 19, 22, 23, 26 and 28. Further, the presently claimed method differs from Krupinski, in that Krupinski's method injects a polymer melt with an amount of a non-oxidizing supercritical fluid at temperatures from 200 to 270°C, and a pressure so as to solubilize the supercritical fluid in the melt (col. 2, lines 35-40). In contrast, in the claimed method, a supercritical gaseous butene-1 is never injected into the polymer melt, but is formed by subjecting a solution of PB-1 in butene-1 to the conditions of step a). Therefore, the reference does not disclose all the elements of the present claims.

Beuermann relates to free radical or ionic polymerization of monomers, which is completely different than the catalytic polymerization of butene-1 as in the present subject matter; in particular, a polymeric solution produced by the liquid-phase (co)polymerization of butene-1 is not disclosed in Beuermann. In fact, in Beuermann's list of polymerizable monomers, shown at page 3, col. 3, paragraph [0011], 1-butene and poly-1-butene are not mentioned at all. Moreover, Beuermann certainly does not disclose the levels of butene-1 or poly-1-butene recited in the

dependent claims, as in, for example, claims 3, 11, 13, 14, 17, 19, 22, 23, 26 and 28. Further, the process described in Beuermann utilizes a supercritical fluid as the reaction medium. In contrast, in the presently claimed subject matter, liquid 1-butene is used. A polymer melt is never obtained in Beuermann's process. Therefore, the reference does not disclose all the elements of the present claims.

The '862 Document does not teach the separation of unreacted butene-1 from a polymeric solution produced by liquid phase (co)polymerization of butene-1 via monomer devolatilization. Rather, the '862 Document teaches the separation of low molecular weight polymer fractions from high molecular weight polymer fractions (page 2, left column, lines 11-20), i.e., a separation of polymer fractions. Therefore, the reference does not disclose all the elements of the present claims.

Thus, since none of the cited references disclose all the elements of the present claims, Applicants respectfully request that the Examiner reconsider and withdraw the rejection.

Applicants submit that the application stands in condition for allowance. Should the Examiner have questions or comments regarding this application or this Amendment, Applicants' attorney would welcome the opportunity to discuss the case with the Examiner.

The Commissioner is hereby authorized to charge U.S. PTO Deposit Account 08-2336 in the amount of any fee required for consideration of this Amendment.

This is intended to be a complete response to the Office Action mailed August 2, 2006.

Respectfully submitted,

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(Date)

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I hereby certify that this correspondence is being deposited with sufficient postage thereon with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on November 16, 2006.

Philip A. Butta

November 16 2006
Date of Signature